
750W BLDC Motor Controller (D07-S)

User's Manual

Version 1.6

2019. 5. 28

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Revision History

No.	Date	Version	Contents	Writer
1	2018-05-08	1.0	First Draft	BD Hwang
2	2018-05-18	1.1	Description error revision	BD Hwang
3	2018-06-11	1.2	Motor Stop Type revision	BD Hwang
4	2018-06-20	1.3	Parameter revision	BD Hwang
5	2018-11-05	1.4	Wiring diagram, Alarm led flash time revision	BD Hwang
6	2018-11-30	1.5	OP500 Parameter #3 definition revision	BD Hwang
7	2019-05-28	1.6	OP500 Parameter definition revision (#22~#38)	BD Hwang

1. Introduction

The manual introduces BLDC motor controllers (D07-S) features, wiring and installation. Read the manual carefully and thoroughly before using the controller.

2. Specifications

Item	Description	Mark
Rated Voltage	DC24~48V($\pm 10\%$)	** OP-500 Setting
Low-Voltage Detection	20V(@24V), 31.5V (@36V), 41.5V (@48V)	** OP-500 Setting
Rated Power	750W	
Rated Current	35A rms	
Max Current	70A rms, 1 min	
Feedback Sensor	Hall effect	
Driving Method	6-step Commutation	
Protection	Low-Voltage, Over-Voltage, Over-Current, Over-Temp., Over-Load, Stall, Hall sensor failure	
Operating Temperature	-25°C ~ 60°C	
IP Grade	TBD	
Case	Aluminum	
Size(mm)	164x88x46	Included Heatsink
I/O	Input Voltage	- Battery (+),(-)
	Motor Phase	- U, V, W
	Motor Speed	- +5VDC, Signal, GND
	Hall Sensor	- Hu, Hv, Hw
	Motor Stop	- Motor Stopping
	Forward/Reverse	- Motor Direction (CW/CCW)
	Alarm Reset	- Alarm Status Release
	Electromagnetic Brake	- EM Brake ON/OFF
	Speed Pulse Out	- Output Select (OP-500) (Open Collector)
	Alarm Out	- Output Select (OP-500) (Open Collector)
	Status LED	- RGB color display Red: Alarm Status, Green: Controller On/Off Blue: Motor Run/Stop

3. Power & I/O Interface

3.1 Power

Name	#	Num.	Type	Description
B +, B -	2	-	PWR	Battery (+), (-)
Motor U, V, W	3	-	PWR	Motor 3 Phase

3.2 Hall sensor

Name	#	Num.	Type	Description
Hall U	1	6	I	Hall sensor U
Hall V	1	5	I	Hall sensor V
Hall W	1	4	I	Hall sensor W
GND	2	1,2	PWR	Hall sensor (-)
+15VDC	1	3	PWR	Hall sensor (+)

3.3 Control I/O

Name	#	Num.	Type	Description
Speed (+5VDC)	1	6	PWR	Speed Signal Power(+)
Speed (Signal)	1	5	I	Speed Signal (0~5V)
Speed (GND)	1	4	PWR	Speed Signal Power(-)
Forward/Reverse	1	3	I	Motor Direction (CW / CCW)
Controller On/Off	1	2	I	Speed Signal Power(-)
Motor Stop	1	1	I	Motor Stopping
GND	2	10,12	PWR	Ground
EM Brake	1	11	O	EM Brake On / Off
Alarm Reset	1	9	I	Alarm release
Speed Pulse Out	1	8	O	Motor Speed Pulse (Open Collector)
Alarm Out	1	7	O	Alarm Signal (Open Collector)

3.4 Serial Comm.

Name	#	Num.	Type	Description
OP-500 (+5VDC)	1	4	RS-232	OP-500 (+)
OP-500 (GND)	1	5	RS-232	OP-500 (-)
OP-500 (RX)	1	6	PWR	RXD (from OP-500)
OP-500 (TX)	1	7	PWR	TXD (to OP-500)
RS-485 (A+)	1	8	RS-485	T/R+
RS-485 (B-)	1	9	RS-485	T/R-

4. Overview

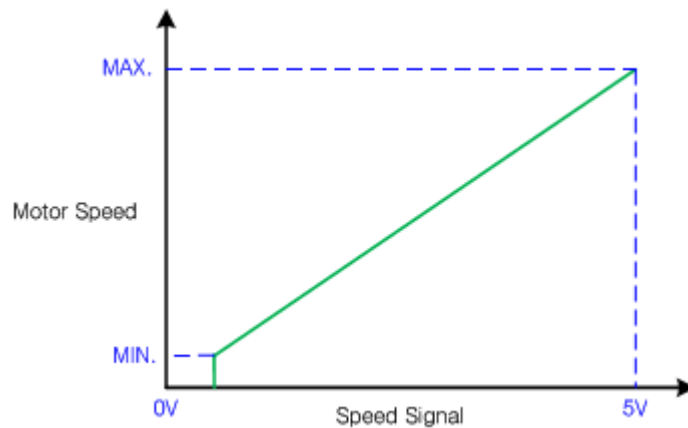
D07-S is designed to drive the 750w BLDC motor and uses DC power sources of 24 to 48VDC, including batteries of 24, 36, and 48 volts. Also, this product is designed with the capabilities and features as below:

- Open & closed loop control
- Trapezoidal or sinusoidal operating with Hall Sensors
- 2 or 4 quadrant operation.
- Alarm protection: Low-Voltage, Over-Voltage, Over-Current, Over-Temp., Over-Load, Stall, Hall sensor
- Applications: Agricultural /industrial electric cart, electric wheelchair, electric cart, AGV etc.

4.1 Input Voltage

Operation rated voltage range is DC24~48V (Parameter Setting using OP-500 loader)

4.2 Motor Speed



Set the operating speed of the motor using external analog signal (I/O Pin#18). An external potentiometer must be 10K Ω , 1/4 W or higher. The speed of the motor can be controlled by the analog voltage (0 ~ 5VDC).

4.3 Motor Direction

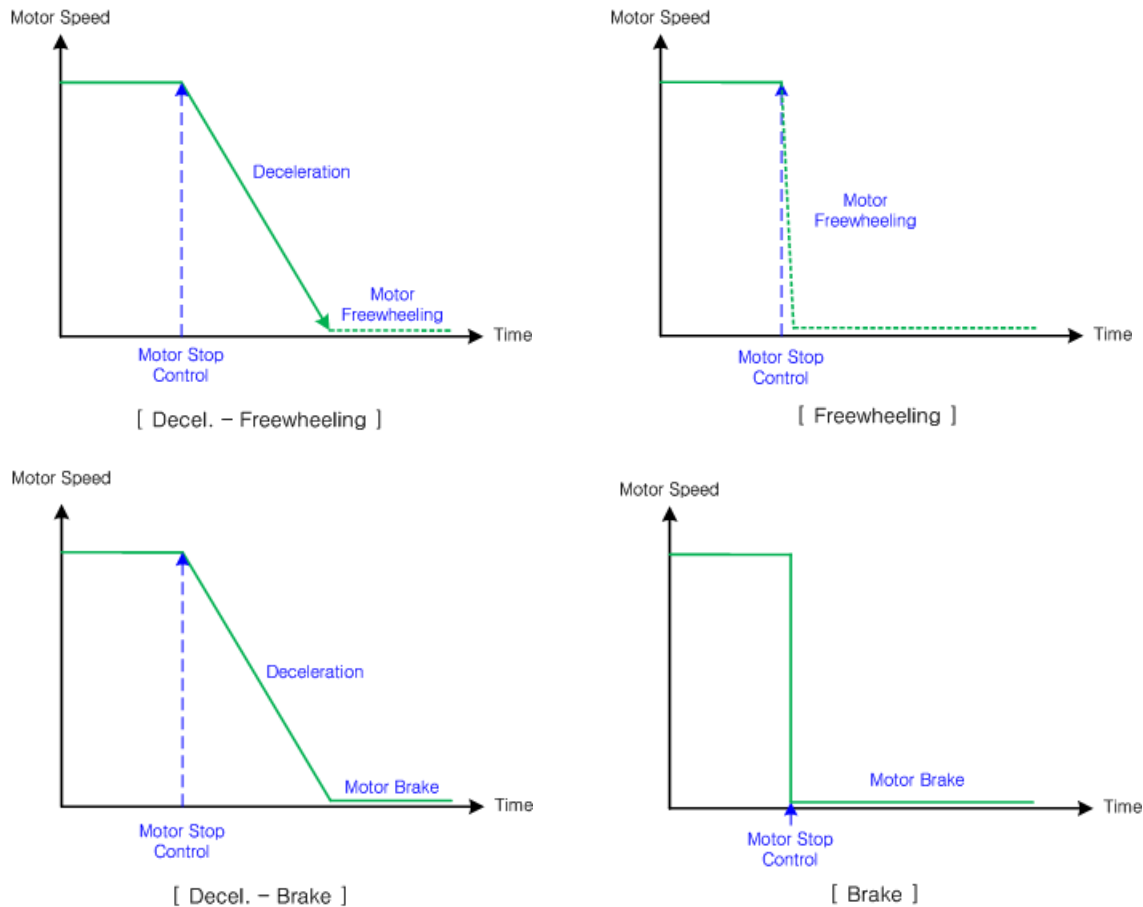
When I/O Pin#3(Forward) is short with GND, motor will turn clockwise.
When I/O Pin#3(Reverse) is short with +5V, motor will turn counterclockwise.

4.4 Controller On/Off

When I/O Pin#3 is short with GND, motor will turn clockwise.

When I/O Pin#3 is open (Internal +5VDC Pull-up), motor will turn counterclockwise.

4.5 Motor Stop

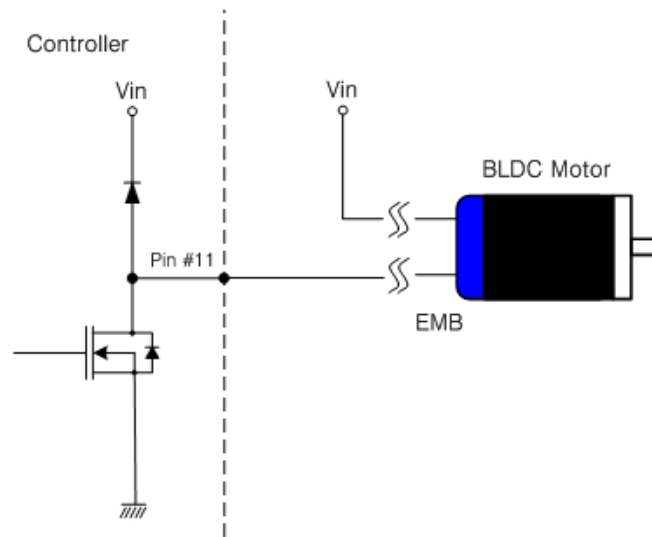


When I/O Pin#1 is short with GND, the motor will go to freewheeling (stop naturally) after deceleration time.

[Motor Stop Type Selection]

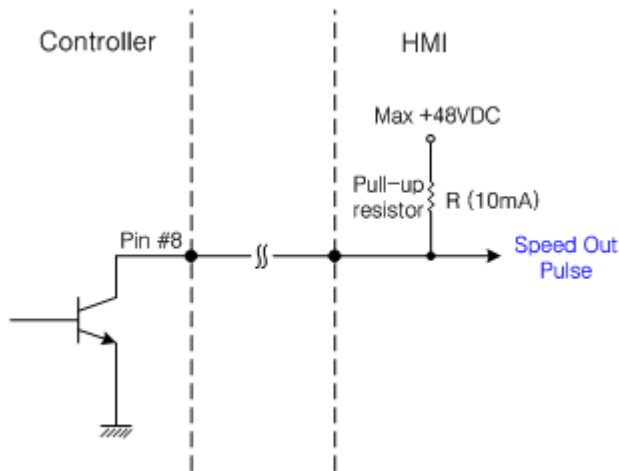
- (1) Decel. – Freewheeling : OP500 Parameter #29 is 0
- (2) Freewheeling : OP500 Parameter #29 is 1
- (3) Decel. – Brake : OP500 Parameter #29 is 2
- (4) Brake : OP500 Parameter #29 is 3

4.6 EM Brake Control



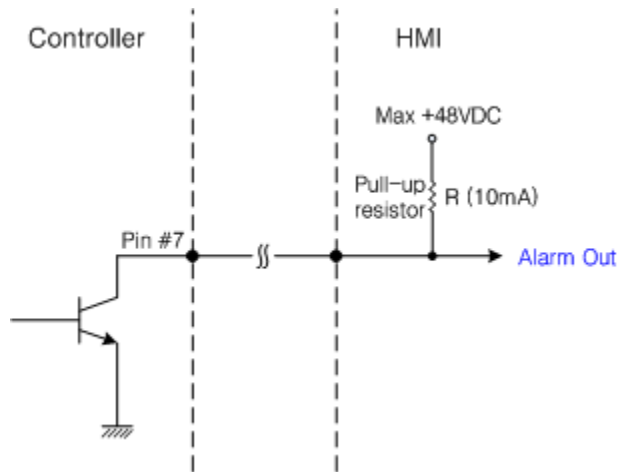
When I/O Pin#11 is short with GND, EM Brake is activated.

4.7 Motor Speed Output



- I/O Pin#8 outputs a signal pulse, when motor rotates.

4.8 Alarm Output



- I/O Pin#7 will be triggered (pulled to low), when alarm condition occurs.

4.9 Alarm Reset

- When I/O Pin#7 is short with GND, Alarm status is released.

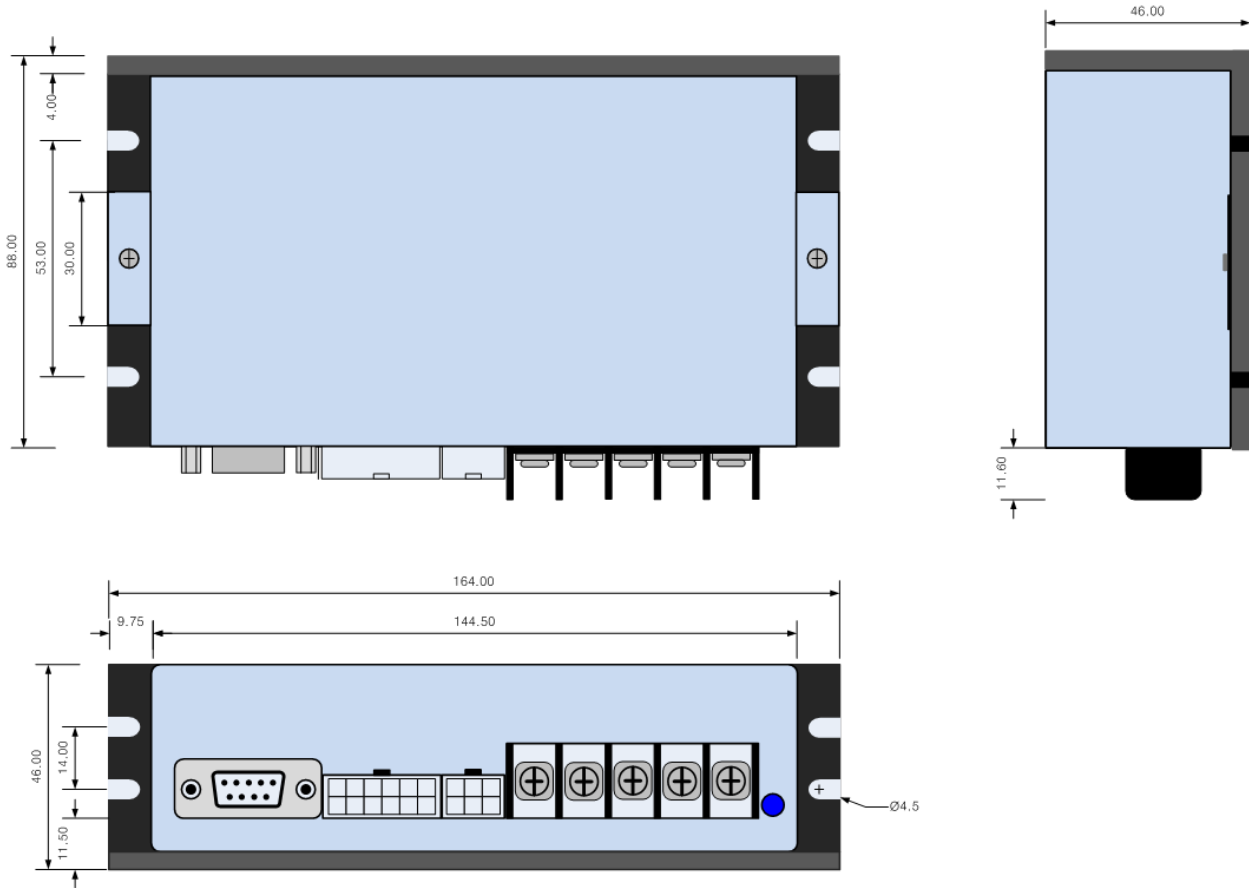
4.10 Alarm Status LED

Item	LED Status	Mark
Hall sensor	1 flash / 6sec	Motor stopping
Low-voltage	2 flashes / 6sec	Motor stopping
Over-load	3 flashes / 6sec	Motor stopping
Parameter	4 flashes / 6sec	Motor stopping
Over-heat	5 flashes / 6sec	Motor stopping
Over-voltage	6 flashes / 6sec	Motor stopping
Over-speed	7 flashes / 6sec	Motor stopping
Over-current	8 flashes / 6sec	Motor stopping
Motor Stall	9 flashes / 6sec	Motor stopping

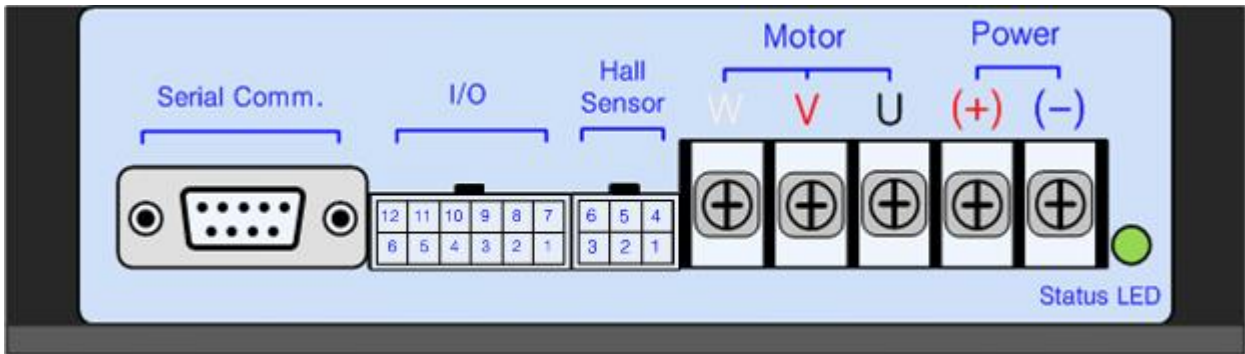
NO Alarm	<ul style="list-style-type: none">☞ Controller On: ON (Green)☞ Controller Off: OFF☞ Motor Run: ON (Blue)☞ Motor Stop: OFF
** Alarm history can be checked using OP-500 loader	

5. Wiring & Installation

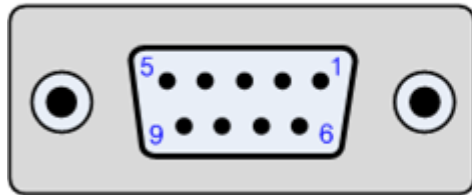
5.1 Dimension



5.2 Ext. Connector Pin Definition

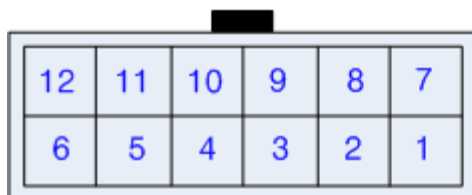


5.2.1. Serial Comm.



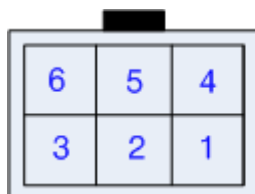
- 1: Not Used
- 2: Not Used
- 3: Not Used
- 4: OP-500 (+5VDC)
- 5: OP-500 (GND)
- 6: OP-500 (RX)
- 7: OP-500 (TX)
- 8: RS-485 (A+)
- 9: RS-485 (B-)

5.2.2. I/O



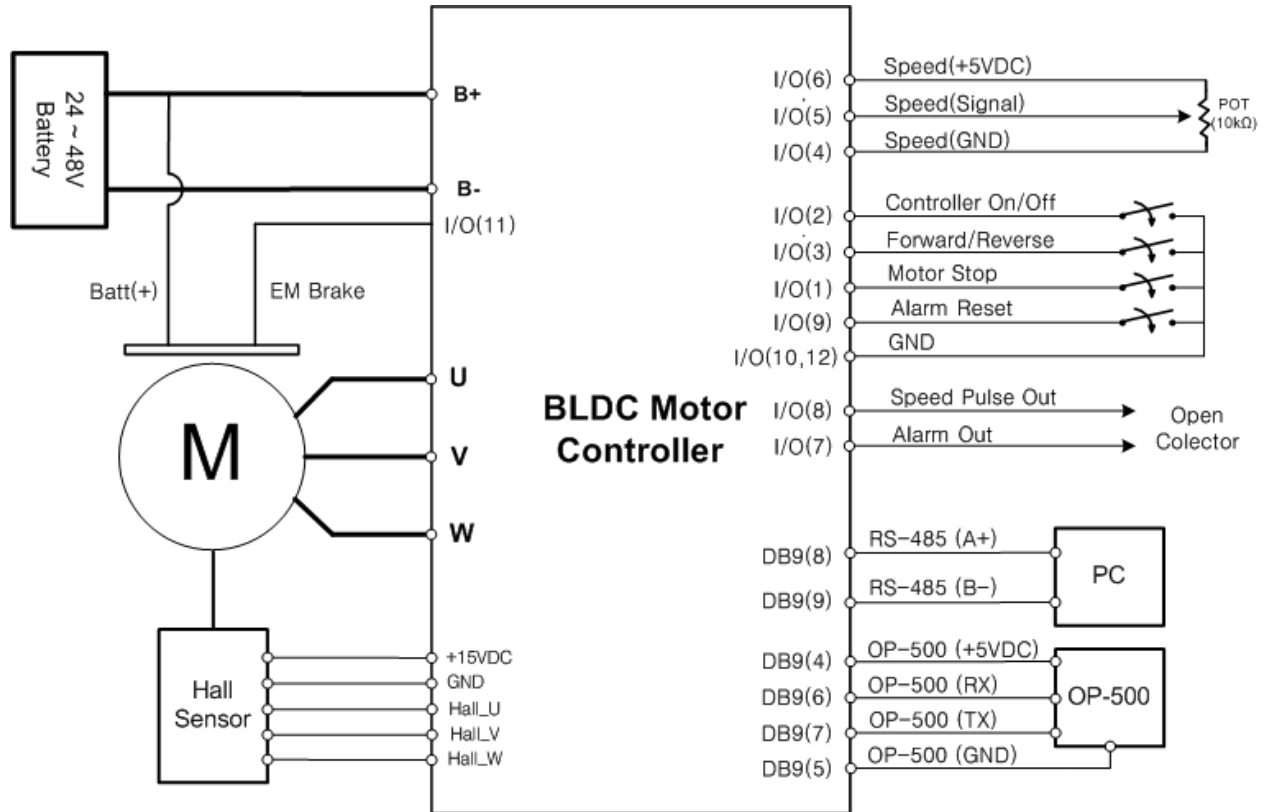
- 1: Motor Stop
- 2: Controller On/Off
- 3: Forward/Reverse
- 4: Speed (GND)
- 5: Speed (Signal)
- 6: Speed (+5VDC)
- 7: Alarm Out
- 8: Speed Pulse Out
- 9: Alarm Reset
- 10: GND
- 11: EM Brake
- 12: GND

5.2.3. Hall Sensor



- 1: GND
- 2: GND
- 3: +15VDC
- 4: Hall_W (YELLOW)
- 5: Hall_V (BLUE)
- 6: Hall_U (WHITE)

5.3 Wiring Diagram



6. Appendix

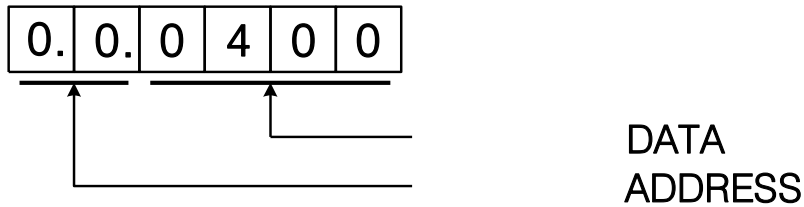
6.1 Product Photograph



User Parameter Mode

1. Press MODE button to enter Parameter Mode

The Parameter Mode configured with ADDRESS & DATA are displayed as shown below.



2. Select ADDRESS number you want

Press the UP or DOWN button to select the Parameter number you want to change

ex)

0.	4.	0	9	0	0
----	----	---	---	---	---

☞ If you press the SET button when selecting Parameter #4 (RPM), DATA field will change to flashing.

3. Change to the value you want

Pressing the UP or DOWN button will change the DATA value

ex)

0.	4.	0	9	0	0
----	----	---	---	---	---

 →

0.	4.	1	2	0	0
----	----	---	---	---	---

☞ after selecting the DATA value you want, press the SET button and the flashing part will be stopped and the setting completion status will be informed.

※ If you press the button once, DATA value changes by 1, and if you hold it, you can change it more quickly.

[OP-500 Parameter]

#	NAME	Range	Type	Mark
0	Motor Watts	200~2000		[W]
1	Pole Pairs	2~30		[Poles]
2	Encoder Pulse	0~9999		[Pulse]
3	Direction	0/1		1: Reverse the current setting direction
4	Motor RPM	0~20000		[RPM]
5	PWM Mode	0/1		0:Trapizoidal, 1:Sinusoidal
6	Operation Mode	0/1		0: Closed, 1: Open
7	Input Voltage	6~60		[V]
8	Low-Voltage	6~60		[V]
9	Over-Voltage	6~60		[V]
10	Current Limit	50~250		[%]
11	Speed Input Scale	0~5000		[mV]
12	Accel./Decel. Time	1~100		1: 0.08sec (** if #37 = 0, Activation)
13	Over-Load Time	0~9999		[SEC]
14	RPM Limit.	0~9999		[RPM]
15	Speed Input Zero-Clamp	0~5000		[mV]
16	Speed Input Offset	0~5000		[mV]
17	-	-		
18	Over-Heat Temp.	0~100		[°C]
19				
20	CW Advanced Angle	0~90		[degree]
21	CCW Advanced Angle	0~90		[degree]
22	Internal Speed	1800		[RPM]
23	Position Control	0/1		0: NO, 1: YES
24	Accel. Time	1~100		1: 0.08sec (** if #37 = 1, Activation)
25	Decel. Time	1~100		1: 0.08sec (** if #37 = 1, Activation)
26	EMB Delay Time	0~100		1: 0.08sec
27				
28	2 Quad. / 4 Quad.	0/1		0: 2 Quad, 1: 4 Quad
29	Motor Stop Type	0~3		0:Decel.-Free, 1:Free, 2:Decel.-Brake, 3:Brake
30	Speed P gain	0~9999		
31	Speed I gain	0~9999		
32	Current P gain	0~9999		
33	Current I gain	0~9999		
34	Position P gain	0~9999		
35	Motor Type	0/1		
36	Communication Control	0/1		0: IO Control, 1: MODBUS RTU (RS485)
37	Driver Address	0~99		MODBUS Slave Address
38	Communication Speed.	0~3		0: 9600, 1: 19200, 3: 38400, 4: 115200
39				